DEPARTMENT OF
ELECTRICAL AND COMPUTER ENGINEERING

Faculty

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Associate Chair
YOUSEF R. SHAYAN, PhD *Concordia University*, PEng; *Professor*

Professors
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AMIR G. AGHDAM, PhD *University of Toronto*, PEng; *Professor, Provost's Distinction*
M. OMAIR AHMAD, PhD *Concordia University*, PEng; *Provost's Distinction*
OTMANE AIT MOHAMED, PhD *Université Henri Poincaré, Nancy I*, ing.
AMIR ASIF, PhD *Carnegie Mellon University*, PEng
HABIB BENALI, PhD *Rennes I University*
WALAA HAMOUDA, PhD *Queen's University*, PEng
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M. ZAHANGIR KABIR, PhD *University of Saskatchewan*, PEng
MOJTABA KAHRIZI, PhD *Concordia University*, ing.
FERHAT KHENDEK, PhD *Université de Montréal*, ing.
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Research Professor
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EUGENE I. PLOTKIN, PhD *Electrical Engineering Institute of Communication Engineering, St. Petersburg*
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Professors Emeriti
AHMED K. ELHAKEEM, PhD *Southern Methodist University*, PEng
J. CHARLES GIGUÈRE, PhD *Nova Scotia Technical College*
KRISHNAIYAN THULASIRAMAN, PhD *Indian Institute of Technology, Madras*

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GLENN COWAN, PhD *Columbia University*, PEng
SHAHIN HASHTRUDI ZAD, PhD *University of Toronto*, PEng
NAWWAF N. KHARMA, PhD *University of London*, PEng
YAN LIU, PhD *University of Sydney*, PEng

DONGYU QIU, PhD *Purdue University*, PEng
AKSHAY KUMAR RATHORE, PhD *University of Victoria*
POUYA VALIZADEH, PhD *University of Michigan*, PEng

Assistant Professors
CHUNYAN LAI, PhD *University of Windsor*
HASSAN RIVAZ, PhD *Johns Hopkins University*, PEng
STEVE SHIH, PhD *University of Toronto*, PEng
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ALI GHRAYEB, PhD *University of Arizona*
JIAREN LIU, PhD *East-China Institute of Technology*
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MARIA TOEROE, PhD *Technical University of Budapest*
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Affiliate Associate Professors
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ANADER BENYAMIN-SEEYAR, PhD *Concordia University*
STEPHANE BLOUIN, PhD *Queen's University*
MOHAMMAD REZA CHAHARMIR, PhD *University of Manitoba*
KE-LIN DU, PhD *Huazhong University of Science and Technology*
MOHAMED ELSHARKAWI, PhD *University of Mississippi*
PAUL MARTINEAU, PhD *McGill University*
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RUPERT BROOKS, PhD *McGill University*
AMJAD GAWANMEH, PhD *Concordia University*
OSMAN HASAN, PhD *Concordia University*
JOHN KARIGIANNIS, PhD *National Technical University of Athens*
SADEGH FARZANEH KOODIANI, PhD *Concordia University*
IMAN MOAZZEN, PhD *University of Victoria*
JULES MOUALEU, PhD *University of KwaZulu-Natal*
SHOKRY SHAMSELDIN, PhD *Concordia University*
IRINA STATEIKINA, PhD *Concordia University*
JELENA TRAJKOVIC, PhD *University of California, Irvine*
BOWEI ZHANG, PhD *Concordia University*

For the complete list of faculty members, please consult the Department website.

Location

Sir George Williams Campus
Engineering, Computer Science and Visual Arts Complex, Room: EV 005.139
514-848-2424, ext. 3100

Department Objectives

The Department of Electrical and Computer Engineering offers three distinct undergraduate programs: BEng in Electrical Engineering, BEng in Computer Engineering, and BEng in Aerospace Engineering.
Electrical Engineering is concerned primarily with energy and information, their conversion and transmission in the most efficient and reliable manner. This vast field of endeavour includes many specialties and electrical engineers may be involved in one or more of these throughout their careers. A partial list includes electronics, integrated circuit design, very large scale integrated (VLSI) circuit design, layout and testing, controls, robotics, system simulation, telecommunications, signal processing, computer hardware design, software design, power devices, power and control systems, electromechanical systems, micro electromechanical devices, electromagnetics, antennas, waveguides, lasers, and optoelectronics.
Computer Engineering is the driving force of the information revolution and its transformation of society. Over the course of their careers, computer engineers will be called upon to meet a number of challenges, most of which cannot be imagined today. A

partial list of current specialties includes computer architecture, digital electronics, digital circuits, very large scale integrated (VLSI) circuit design, layout and testing, digital circuit testing and reliability, software systems engineering, embedded systems, digital communication and computer networks.

The Aerospace Engineering program is offered jointly with the Department of Mechanical, Industrial and Aerospace Engineering. It is concerned with the engineering science that governs the design and construction of aircraft and spacecraft. This includes the mechanisms behind flight and propulsion in the atmosphere and space, including aerodynamics, lift and draft, as well as the design and control of aircrafts. Aerospace systems rely significantly on electrical and computer engineering content, including topics such as avionic navigation systems, communication networks, and flight control systems. More details about the Aerospace Engineering program can be found in §71.55.

The four-year programs consist of the Engineering Core, taken by all Engineering students, program cores and electives. The Electrical Engineering Core provides a solid introduction to all aspects of the discipline, to programming methodology and to the design of large software systems. Technical electives are scheduled to enable students to register for sets of related technical courses. Current sets of electives include: Communications and Signal Processing, Electronics and VLSI, Power, Control Systems and Avionics, Waves and Electromagnetics, Computer Systems, and Biological and Biomedical Engineering. The Computer Engineering Core provides a thorough grounding in all aspects of computer hardware and software. Technical electives allow students to acquire further knowledge in various aspects of hardware or software. The Aerospace Engineering Core provides a solid introduction to Flight and Aerospace Systems, Modelling and Control Systems, Mechanics of Materials, Thermodynamics, and Fluid Mechanics. Technical electives allow students to gain more knowledge in a variety of topics related to flight control and navigation systems. A mandatory final-year design project gives students in all three programs the opportunity to apply the knowledge they have acquired to the design and testing of a working prototype.

Nine Quebec universities have joined together with Hydro-Québec to create the Institute for Electrical Power Engineering whose primary mission is to meet the anticipated shortfall in this area. Students accepted by the Institute are expected to complete six courses offered by participating universities. Some of these courses are offered in English and others in French. Students register for courses at their home universities.

71.30.1 Course Requirements (BEng in Electrical Engineering)

The program in Electrical Engineering consists of the Engineering Core, the Electrical Engineering Core, and one of five choices as set out below. The normal length of the program is 120 credits.

Students in the Electrical Engineering program are required to complete at least one work term administered by either the CIADI (§71.10.9) or co-op (§71.10.8) offices. Only work terms undertaken after successfully completing 75 credits in the Electrical Engineering program, including ELEC 390, would satisfy this requirement.

In order to fulfill the work term, students must successfully complete one of the courses managed through CIADI or the Institute for Co-operative Education.

It should be noted that ultimately it is the responsibility of the student to find an approved work-term placement.

For information on co-op fees, see concordia.ca/academics/co-op/students/fees.

Engineering Core (30.5 credits)
See §71.20.5.

Electrical Engineering Core		*Credits*
COEN 212	Digital Systems Design I	3.50
COEN 231	Introduction to Discrete Mathematics	3.00
COEN 243	Programming Methodology I	3.00
COEN 244	Programming Methodology II	3.00
COEN 311	Computer Organization and Software	3.50
ELEC 242	Continuous-Time Signals and Systems	3.00
ELEC 251	Fundamentals of Applied Electromagnetics	3.00
ELEC 311	Electronics I	3.50
ELEC 312	Electronics II	3.50
ELEC 321	Introduction to Semiconductor Materials and Devices	3.50
ELEC 331	Fundamentals of Electrical Power Engineering	3.50
ELEC 342	Discrete-Time Signals and Systems	3.50
ELEC 351	Electromagnetic Waves and Guiding Structures	3.00
ELEC 365	Complex Variables and Partial Differential Equations	3.00
ELEC 367	Introduction to Digital Communications	3.50
ELEC 372	Fundamentals of Control Systems	3.50
ELEC 390	Electrical Engineering Product Design Project	3.00
ELEC 490	Capstone Electrical Engineering Design Project	4.00
ENGR 290	Introductory Engineering Team Design Project	3.00
		62.50

Students may choose one of the following options:

I. Electronics/VLSI Option
II. Telecommunications Option
III. Power and Renewable Energy Option
IV. Avionics and Control Option

Otherwise, students must follow V.

I. Electronics/VLSI Option		Credits
COEN 315	Digital Electronics	3.50
COEN 451	VLSI Circuit Design	4.00
	Minimum number of Elective credits:	19.50
	at least 7.5 of these 19.5 credits must be taken from the Electronics/VLSI Option Electives list. The rest may be chosen from the Electrical Engineering Electives list.	
		27.00

Electronics/VLSI Option Electives		Credits
COEN 313	Digital Systems Design II	3.50
COEN 413	Hardware Functional Verification	3.00
ELEC 413	Mixed-Signal VLSI for Communication Systems	4.00
ELEC 421	Solid State Devices	3.50
ELEC 422	Design of Integrated Circuit Components	3.50
ELEC 423	Introduction to Analog VLSI	4.00
ELEC 424	VLSI Process Technology	3.50
ELEC 425	Optical Devices for High-Speed Communications	3.50
ELEC 433	Power Electronics	3.50
ELEC 441	Modern Analog Filter Design	3.50
ELEC 442	Digital Signal Processing	3.50

II. Telecommunications Option		Credits
ELEC 463	Telecommunication Networks	3.50
ELEC 464	Wireless Communications	3.00
	Minimum number of Elective credits:	20.50
	at least 9 of these 20.5 credits must be taken from the Telecommunications Option Electives list. The rest may be chosen from the Electrical Engineering Electives list.	
		27.00

Telecommunications Option Electives		Credits
COEN 446	Internet of Things	3.00
COEN 447	Software-Defined Networking	3.00
ELEC 413	Mixed-Signal VLSI for Communication Systems	4.00
ELEC 425	Optical Devices for High-Speed Communications	3.50
ELEC 442	Digital Signal Processing	3.50
ELEC 453	Microwave Engineering	3.50
ELEC 456	Antennas	3.50
ELEC 457	Design of Wireless RF Systems	3.00
ELEC 465	Networks Security and Management	3.50
ELEC 466	Introduction to Optical Communication Systems	3.50
ELEC 470	Broadcast Signal Transmission	3.00
ELEC 472	Advanced Telecommunication Networks	3.50

III. Power and Renewable Energy Option		Credits
ELEC 433	Power Electronics	3.50
ELEC 437	Renewable Energy Systems	3.00
ELEC 440	Controlled Electric Drives	3.50

ELEC 481	Linear Systems	3.50
	Minimum number of Elective credits:	13.50
	at least 3 of these 13.5 credits must be taken from the	
	Power and Renewable Energy Option Electives list. The rest	
	may be chosen from the Electrical Engineering Electives list.	

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                                                                    27.00

Power and Renewable Energy Option Electives   *Credits*

ELEC 430	Electrical Power Equipment*	3.50
ELEC 431	Electrical Power Systems	3.50
ELEC 432	Control of Electrical Power Conversion Systems*	3.50
ELEC 434	Behaviour of Power Systems*	3.50
ELEC 435	Electromechanical Energy Conversion Systems	3.50
ELEC 436	Protection of Power Systems*	3.50
ELEC 438	Industrial Electrical Systems*	3.50
ELEC 439	Hybrid Electric Vehicle Power System Design and Control	3.00
ELEC 442	Digital Signal Processing	3.50
ELEC 482	System Optimization	3.50
ELEC 483	Real-Time Computer Control Systems	3.50

*Note: ELEC 430, 432, 434, 436, and 438 are usually offered in the French language.

IV. Avionics and Control Option   *Credits*

AERO 417	Standards, Regulations and Certification	3.00
AERO 480	Flight Control Systems	3.50
AERO 482	Avionic Navigation Systems	3.00
AERO 483	Integration of Avionics Systems	3.00
ELEC 483	Real-Time Computer Control Systems	3.50
	Minimum number of Elective credits:	11.00
	Electives must be chosen from the	
	Electrical Engineering Electives list.	

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                                                                    27.00

V. For students NOT selecting an option: *Credits*
General Stream

COEN 313	Digital Systems Design II	3.50
COEN 352	Data Structures and Algorithms	3.00
ELEC 463	Telecommunication Networks	3.50
	Minimum number of Elective credits:	17.00
	Electives must be chosen from the	
	Electrical Engineering Electives list.	

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                                                                    27.00

Electrical Engineering Electives
Courses are listed in groups to facilitate course selection. With adequate academic justification and with permission of the Department, students may take one technical elective course from the Computer Engineering Electives list.

A. Communications and Signal Processing   *Credits*

COEN 446	Internet of Things	3.00
COEN 447	Software-Defined Networking	3.00
ELEC 441	Modern Analog Filter Design	3.50
ELEC 442	Digital Signal Processing	3.50
ELEC 463	Telecommunication Networks	3.50
ELEC 464	Wireless Communications	3.00
ELEC 465	Networks Security and Management	3.50
ELEC 466	Introduction to Optical Communication Systems	3.50
ELEC 470	Broadcast Signal Transmission	3.00
ELEC 472	Advanced Telecommunication Networks	3.50

B. Electronics/VLSI *Credits*

COEN 315	Digital Electronics	3.50
COEN 413	Hardware Functional Verification	3.00
COEN 451	VLSI Circuit Design	4.00
ELEC 413	Mixed-Signal VLSI for Communication Systems	4.00
ELEC 421	Solid State Devices	3.50
ELEC 422	Design of Integrated Circuit Components	3.50
ELEC 423	Introduction to Analog VLSI	4.00
ELEC 424	VLSI Process Technology	3.50
ELEC 425	Optical Devices for High-Speed Communications	3.50

C. Power *Credits*

ELEC 430	Electrical Power Equipment*	3.50
ELEC 431	Electrical Power Systems	3.50
ELEC 432	Control of Electrical Power Conversion Systems*	3.50
ELEC 433	Power Electronics	3.50
ELEC 434	Behaviour of Power Systems*	3.50
ELEC 435	Electromechanical Energy Conversion Systems	3.50
ELEC 436	Protection of Power Systems*	3.50
ELEC 437	Renewable Energy Systems	3.00
ELEC 438	Industrial Electrical Systems*	3.50
ELEC 439	Hybrid Electric Vehicle Power System Design and Control	3.00
ELEC 440	Controlled Electric Drives	3.50

*Note: ELEC 430, 432, 434, 436, and 438 are usually offered in the French language.

D. Control Systems and Avionics *Credits*

AERO 417	Standards, Regulations, and Certification	3.00
AERO 480	Flight Control Systems	3.50
AERO 482	Avionic Navigation Systems	3.00
AERO 483	Integration of Avionics Systems	3.00
ELEC 473	Autonomy for Mobile Robots	3.00
ELEC 481	Linear Systems	3.50
ELEC 482	System Optimization	3.50
ELEC 483	Real-Time Computer Control Systems	3.50
ENGR 472	Robot Manipulators	3.50

E. Waves and Electromagnetics *Credits*

ELEC 453	Microwave Engineering	3.50
ELEC 455	Acoustics	3.00
ELEC 456	Antennas	3.50
ELEC 457	Design of Wireless RF Systems	3.00
ELEC 458	Techniques in Electromagnetic Compatibility	3.00

F. Computer Systems *Credits*

COEN 313	Digital Systems Design II	3.50
COEN 316	Computer Architecture and Design	3.50
COEN 317	Microprocessor Systems	3.50
COEN 320	Introduction to Real-Time Systems	3.00
COEN 345	Software Testing and Validation	3.50
COEN 346	Operating Systems	3.50
COEN 352	Data Structures and Algorithms	3.00
COEN 421	Embedded Systems Design	4.00
COEN 422	Cyber-Physical Systems	3.00
COEN 424	Programming on the Cloud	3.00
SOEN 341	Software Process	3.00
SOEN 342	Software Requirements and Specifications	3.00
SOEN 343	Software Architecture and Design I	3.00

G. Biological and Biomedical Engineering *Credits*

COEN 432	Applied Evolutionary and Learning Algorithms	3.00
COEN 433	Biological Computing and Synthetic Biology	3.00

COEN 434	Microfluidic Devices for Synthetic Biology	3.00
ELEC 444	Medical Image Processing	3.00
ELEC 445	Biological Signal Processing	3.00

H. Other   *Credits*

| ELEC 498 | Topics in Electrical Engineering | 3.00 |
| ENGR 411 | Special Technical Report | 1.00 |

71.30.2 Course Requirements (BEng in Computer Engineering)

The program in Computer Engineering consists of the Engineering Core, the Computer Engineering Core, and one of four choices as set out below. The normal length of the program is 120 credits.

Students in the Computer Engineering program are required to complete at least one work term administered by either the CIADI (§71.10.9) or co-op (§71.10.8) offices. Only work terms undertaken after successfully completing 75 credits in the Computer Engineering program, including COEN 390, would satisfy this requirement.

In order to fulfill the work term, students must successfully complete one of the courses managed through CIADI or the Institute for Co-operative Education.

It should be noted that ultimately it is the responsibility of the student to find an approved work-term placement.

For information on co-op fees, see concordia.ca/academics/co-op/students/fees.

Engineering Core: (30.5 credits)
See §71.20.5.

Computer Engineering Core   *Credits*

COEN 212	Digital Systems Design I	3.50
COEN 231	Introduction to Discrete Mathematics	3.00
COEN 243	Programming Methodology I	3.00
COEN 244	Programming Methodology II	3.00
COEN 311	Computer Organization and Software	3.50
COEN 313	Digital Systems Design II	3.50
COEN 316	Computer Architecture and Design	3.50
COEN 317	Microprocessor Systems	3.50
COEN 346	Operating Systems	3.50
COEN 352	Data Structures and Algorithms	3.00
COEN 390	Computer Engineering Product Design Project	3.00
COEN 490	Capstone Computer Engineering Design Project	4.00
ELEC 242	Continuous-Time Signals and Systems	3.00
ELEC 311	Electronics I	3.50
ELEC 321	Introduction to Semiconductor Materials and Devices	3.50
ELEC 342	Discrete-Time Signals and Systems	3.50
ELEC 353	Transmission Lines, Waves and Signal Integrity	3.00
ELEC 372	Fundamentals of Control Systems	3.50
ENGR 290	Introductory Engineering Team Design Project	3.00
SOEN 341	Software Process	3.00
		66.00

Students may choose one of the following options:
I.   Avionics and Embedded Systems Option
II. Biological and Biomedical Engineering (BME) Option
III. Pervasive Computing Option

Otherwise, students must follow IV.

I. Avionics and Embedded Systems Option Core   *Credits*

AERO 480	Flight Control Systems	3.50
AERO 482	Avionic Navigation Systems	3.00
AERO 483	Integration of Avionics Systems	3.00
COEN 320	Introduction to Real-Time Systems	3.00
COEN 421	Embedded Systems Design	4.00
	Minimum number of Elective credits	7.00
	must be chosen from the Computer Engineering Electives list	
		23.50

II. Biological and Biomedical Engineering (BME) Option Core   *Credits*

COEN 433	Biological Computing and Synthetic Biology	3.00
ELEC 444	Medical Image Processing	3.00
	Minimum number of Elective credits:	17.50
	at least 9 of these 17.5 credits must be taken from the	
	Biological and Biomedical Engineering Option Electives list.	
	Not more than two science courses (BIOL or PHYS) may be taken.	
	The remaining 8.5 credits may be chosen from the Computer	
	Engineering Electives list.	

		23.50

Biological and Biomedical Engineering (BME) Option Electives   *Credits*

COEN 432	Applied Evolutionary and Learning Algorithms	3.00
COEN 434	Microfluidic Devices for Synthetic Biology	3.00
ELEC 442	Digital Signal Processing	3.50
ELEC 445	Biological Signal Processing	3.00
BIOL 261	Molecular and General Genetics	3.00
BIOL 266	Cell Biology	3.00
BIOL 367	Molecular Biology	3.00
PHYS 260	Introductory Biophysics	3.00
PHYS 443	Quantitative Human Systems Physiology	3.00
PHYS 445	Principles of Medical Imaging	3.00

III. Pervasive Computing Option Core   *Credits*

COEN 320	Introduction to Real-Time Systems	3.00
COEN 421	Embedded Systems Design	4.00
COEN 424	Programming on the Cloud	3.00
COEN 445	Communication Networks and Protocols	3.50
	Minimum number of Elective credits:	10.00
	at least 3 of these 10 credits must be taken from the	
	Pervasive Computing Option Electives list. The rest may	
	be chosen from the Computer Engineering Electives list.	

		23.50

Pervasive Computing Option Electives   *Credits*

COEN 422	Cyber-Physical Systems	3.00
COEN 446	Internet of Things	3.00
COEN 447	Software-Defined Networking	3.00
ELEC 367	Introduction to Digital Communications	3.50
ELEC 472	Advanced Telecommunication Networks	3.50
SOEN 321	Information Systems Security	3.00

IV. For students NOT selecting an option: *Credits*
General Stream

COEN 320	Introduction to Real-Time Systems	3.00
COEN 445	Communication Networks and Protocols	3.50
	Minimum number of Elective credits:	17.00
	at least 3 of these 17 credits must be taken from the	
	General Stream Electives list. The rest may be chosen	
	from the Computer Engineering Electives list.	

		23.50

General Stream Electives   *Credits*

COEN 345	Software Testing and Validation	3.50
COEN 413	Hardware Functional Verification	3.00
SOEN 321	Information Systems Security	3.00

Computer Engineering Electives

Courses are listed in groups to facilitate course selection. With adequate academic justification and with permission of the Department, students may take one technical elective course from the Electrical Engineering Electives list.

A. Hardware/Electronics/VLSI *Credits*

COEN 315	Digital Electronics	3.50
COEN 413	Hardware Functional Verification	3.00
COEN 451	VLSI Circuit Design	4.00
ELEC 312	Electronics II	3.50
ELEC 413	Mixed-Signal VLSI for Communication Systems	4.00
ELEC 423	Introduction to Analog VLSI	4.00
ELEC 458	Techniques in Electromagnetic Compatibility	3.00

B. Real-Time and Software Systems *Credits*

COEN 320	Introduction to Real-Time Systems	3.00
COEN 345	Software Testing and Validation	3.50
COEN 421	Embedded Systems Design	4.00
COEN 422	Cyber-Physical Systems	3.00
COEN 424	Programming on the Cloud	3.00
COEN 432	Applied Evolutionary and Learning Algorithms	3.00

C. Biological and Biomedical Engineering *Credits*

COEN 432	Applied Evolutionary and Learning Algorithms	3.00
COEN 433	Biological Computing and Synthetic Biology	3.00
COEN 434	Microfluidic Devices for Synthetic Biology	3.00
ELEC 444	Medical Image Processing	3.00
ELEC 445	Biological Signal Processing	3.00

D. Computer Science and Software Engineering *Credits*

COMP 335	Introduction to Theoretical Computer Science	3.00
COMP 353	Databases	4.00
COMP 371	Computer Graphics	4.00
COMP 426	Multicore Programming	4.00
COMP 428	Parallel Programming	4.00
COMP 442	Compiler Design	4.00
COMP 451	Database Design	4.00
COMP 465	Design and Analysis of Algorithms	3.00
COMP 472	Artificial Intelligence	4.00
COMP 474	Intelligent Systems	4.00
SOEN 321	Information Systems Security	3.00
SOEN 342	Software Requirements and Specifications	3.00
SOEN 343	Software Architecture and Design I	3.00
SOEN 344	Software Architecture and Design II	3.00
SOEN 357	User Interface Design	3.00
SOEN 448	Management of Evolving Systems	3.00

E. Telecommunications, Networks and Signal Processing *Credits*

COEN 445	Communication Networks and Protocols	3.50
COEN 446	Internet of Things	3.00
COEN 447	Software-Defined Networking	3.00
ELEC 367	Introduction to Digital Communications	3.50
ELEC 442	Digital Signal Processing	3.50
ELEC 465	Networks Security and Management	3.50
ELEC 470	Broadcast Signal Transmission	3.00
ELEC 472	Advanced Telecommunication Networks	3.50

F. Control Systems *Credits*

ELEC 473	Autonomy for Mobile Robots	3.00
ELEC 481	Linear Systems	3.50
ELEC 482	System Optimization	3.50

| ELEC 483 | Real-Time Computer Control Systems | 3.50 |
| ENGR 472 | Robot Manipulators | 3.50 |

G. Avionics *Credits*

AERO 417	Standards, Regulations and Certification	3.00
AERO 480	Flight Control Systems	3.50
AERO 482	Avionic Navigation Systems	3.00
AERO 483	Integration of Avionics Systems	3.00

H. Other *Credits*

| COEN 498 | Topics in Computer Engineering | 3.00 |
| ENGR 411 | Special Technical Report | 1.00 |